OCTOBER, 1961

THE AIR LINE PILOT

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THE AIR LINE PILOT

OCTOBER 1961

Vol. 30, No. 3

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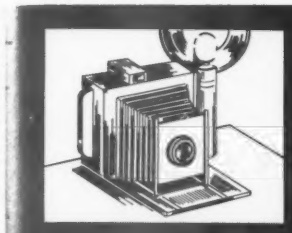
UN WE BELIEVE 66

Boeing Company Photo

Some 32,000 persons fly daily in Boeing 707s and 720s. The popular 707s and 720s serve more than 100 cities in about 50 countries and fly 500,000 miles a day. At least 19 commercial carriers are operating Boeing jets — the number keeps increasing as new planes are delivered or air lines arrange leases to other operators. The United States Air Force Military Air Transport Service has ordered a total of 250 Boeing jetliners.



The ALPA Camera

Some Highlights and Sidelights of the News and ALPA in Pictures

THE FAA'S new Boeing 720 features a paint-job designed to make the aircraft more conspicuous in the air. Each of the colors used serve a specific purpose. The white top reflects the sun, reducing cabin heat. Aluminum and fluorescent red have reflecting qualities that can be seen for many miles and the black nose, when viewed from afar, provides other pilots with a more positive indication of plane's flight path. *Federal Aviation Agency Photo*

AMERICAN AIRLINES has 25 three-engine Boeing 727s on order and expects to introduce the short-range aircraft into service in 1964-65. *American Airlines Photo*

DEBRIS-STREWN swath across cornfield marks course of a TWA Constellation which crashed September 1, near Hinsdale, Illinois, shortly after take-off from Chicago's Midway Airport. All aboard, 78 persons, were killed in the Nation's worst single plane commercial air line disaster. *Wide World Photos*

Wide World Photos

FAA ADMINISTRATOR N. Halaby (left) gets a first hand account of TWA crash from R. Allen of CAB. With the investigators was T. Linnert (fourth from left) head of ALPA's engineering department.

ALPA Photograph

LEFT RUDDER and portion of empennage of the 049 series Constellation stands in the cornfield.

Wide World Photos

PRESS conference on TWA crash was held Sept. 1, in ALPA's home office. N. Halaby is at the left, standing.

Courtesy National Fire Protection Association

Runway Foaming: a report

By CAPTAIN VICTOR HEWES, DAL
and CAPTAIN WILLIAM L. COLLIER, PAA

After careful consideration and study, the ALPA Crash Rescue and Fire Committee recommend runway foaming procedure for use in planned emergency landings because of gear malfunctioning.

DURING the past few years several emergency landings involving landing gear malfunction have been made utilizing a foam blanket laid on the runway to reduce the friction spark ignition hazard which exists when such a landing is made.

Because of the lack of research material and factual information based on past experiences, ALPA, and several interested agencies, had withheld making a positive statement on the use of runway foaming until such data became available. Now, after a period of three to four years of investigation, members of the ALPA Crash Rescue and Fire Committee feel that they can recommend runway foaming procedure to the members for use in all planned emergency landings involving gear malfunctioning—subject to certain limitations to be noted later.

Three sources of ignition

That a fire hazard exists when a gear-up landing is made is common knowledge. But how and why is a subject that was brought into focus in 1953 when the NACA (now NASA) report on the mechanics of "Start and Development of Aircraft Crash Fires" was issued, and later in 1957, when **NACA Technical Note 3973** "Origin and Prevention of Crash Fires in Turbo-jet Aircraft" was released.

The prime cause of any crash fire is the release of combustibles that are ignited from three main ignition sources. First, by sparks generated from the metal surface of the aircraft coming in contact with the paved surface of the runway. Second, by continued rotation of an engine or engines—either turbo-jet or piston—and the resultant exhause hazard. Third, by the residual heat left in the engine after it has been stopped. One other source of ignition—electrical sparks—can be partially controlled in the cockpit by the use of the crash bar isolating the electrical system.

In the course of their studies, the NACA experimentally crashed a large number of obsolete piston and turbo-jet aircraft. As a result, we now have a better understanding of the origin

and behavior of aircraft crash fires. The major part of this study was to determine what factors — if any — would reduce the fire hazard on and after impact. A crash fire protection system was installed in some test aircraft which would shut off the fuel flow to the engines, de-energize the electrical system and spray water as a coolant over the hot engine surfaces. This system was found to be very effective but to date the aircraft industry has not seen fit to incorporate this protection into new types of aircraft; perhaps because of the weight problem involved. We are therefore left with one major ignition source that we can do something about—the friction spark hazard.

Friction ignition hazard

It was not until July, 1960, that the results of research by the U. S. Naval Research Laboratory were issued. The investigation was carried on by H. B. Peterson, E. J. Jablonski, and R. L. Tuve; they compiled their results in the **N.R.L. Report 5492,** July 22, 1960, "Studies on the Fuel-Ignition-Suppression Capability of Foam-Covered Runways for Aircraft."

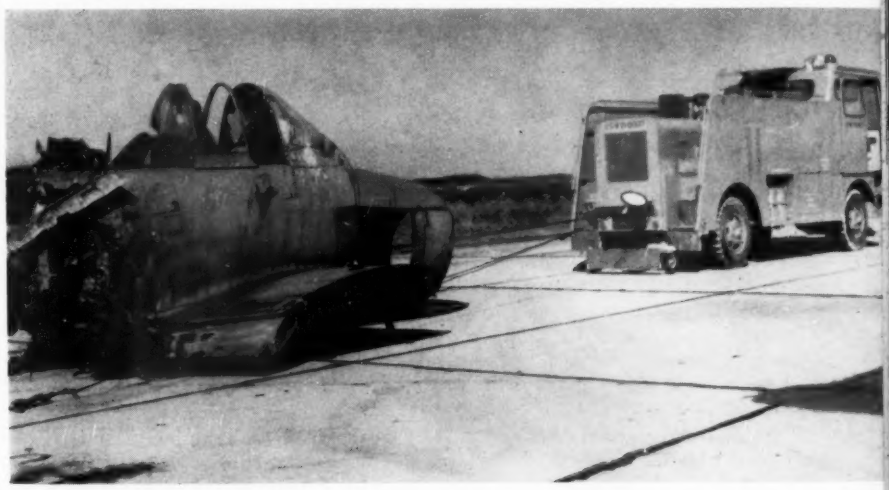
Samples of various metals were run through foam blankets of varying ages and thicknesses. Metals tested were those generally used in aircraft construction such a aluminum, magnesium, titanium, and various grades of steel and stainless steel. Three types of fuel were used in the experiment—aviation gasoline, JP-4, and JP-5. These were sprayed in the sparking area with and without use of the foam blanket and spark suppression effectiveness was recorded.

In summarizing these tests, it was found that aluminum created no sparks, but the foam blanket suppressed spark ignition almost 100 per cent on 420 stainless steel, approximately 90 per cent on 4340 steel, 65 to 70 per cent on 4130 steel, 57 to 79 per cent on 347 stainless steel, and 91 to 100 per cent on magnesium alloy (FS-1). The most outstanding observation made was that the foam blanket had no effect whatsoever on reducing the spark hazard from titanium.

Types of foam

To better understand why this runway foaming procedure is effective, we must define foam. As described in **NFPA Report No. 403,** foam used for aircraft rescue and fire fighting consists of an aggregation of bubbles of lower specific gravity than oil or water, possessing tenacious qualities for covering and clinging to vertical or horizontal surfaces. It should be able to cool hot surfaces, flow over a burning liquid surface and form a long lasting, air-excluding blanket that seals off volatile flammable vapors from access to air or oxygen. Good quality foam should be homogeneous, resisting disruption due to wind and draft or heat and flame attack. It should be capable of resealing in event of mechanical rupture of an established blanket. Foam is of two types:

(1) Chemical foam—A foam which is produced by the reaction of an alkaline salt solution (usually bicarbonate of soda) and an acid salt solution (usually aluminum sulphate) to form a gas (carbon dioxide) in the presence of a foaming agent which causes the gas to be trapped in bubbles to form a foam.



***A PRIME CAUSE** of crash fires is the ignition of fuel by friction sparks. This factor has been studied using obsolete aircraft. The lower picture shows tests made by rubbing various samples of aircraft metal against paved surfaces while being sprayed with aircraft fuels and then tests were made on the effectiveness of foams.* *Official United States Navy Photograph*

Official Unittd States Navy Photograph

FOAM SPREADING truck used at a naval air station.

(2) Mechanical foam (Air Foam)—A foam which is produced by the physical agitation of a mixture of water, air, and a liquid foam compound. It is particularly suited for aircraft rescue and fire fighting because the basic ingredients, water and foam compound, can be carried in bulk to the scene of the accident and brought into operation with a minimum of delay. This is the kind that is most usually found at an airport and because of its availability, it was decided to experiment with a foam blanket on the runway to cut down the friction spark hazard.

The mechanism by which the foam suppresses the generation of the hot metal fragments appears to be the formation of a layer of cooling water at the foam-runway surface interface. This water layer is built up as the water slowly drains out of the foam on standing but is restrained from running off by the foam mass above.

The Navy's experimental project also showed that the jet fuels, Types A and B, were almost as much an ignition hazard as gasoline. Smooth asphalt, smooth concrete and rough concrete were found to increase in spark generating ability in that order.

Tests have been carried out which show that the coefficient of friction between the runway and metal aircraft structure is reduced approximately 50 per cent by utilizing foam; however, it is well known to all pilots the value of a wet foam runway on a smooth landing, and conversely, the deterioration of braking ability. However, NRL conclusions are that a foamed runway does not reduce drag braking resistance any more than a wet runway.

Airport fire equipment

Various problems face the pilot contemplating an emergency landing, the more important of which is: does the airport he is going into have the necessary crash rescue equipment and can this equipment be utilized for foaming a runway? Can the equipment then be recharged and ready for full rescue and fire duty before the landing is made? It has been demonstrated by our ALPA airport survey that very few commercial airports in this country have sufficient equipment available for such a task. Many airports are negligent in this equipment as it has a high recurrent cost of operation due to manpower. The ALPA has repeatedly brought this to the attention of the Federal Government and has drawn up a proposed technical standard order which was presented to the FAA. However, no action has been taken to date, presumably due to the initial high cost of providing adequate crash equipment and especially the high cost of manning it.

Some airport authorities have seen fit to provide first class crash and rescue equipment. One in particular, the New York Port Authority, has excellent rescue equipment and has just ordered a 6,000 gallon truck especially designed for runway foaming. This truck will be based at Idlewild, and all flights faced with an emergency in the New York area will be directed to Idlewild, where runway tie-up is not as serious as Newark or LaGuardia. The armed forces have excellent crash rescue equipment and foaming can generally be requested at all Air Force or Naval fields. Care should be exercised by the pilot in making sure that the fire equipment used for runway foaming can be replenished before the emergency landing takes place. It is of utmost importance for all crash rescue equipment to be operational at that time. Runway foaming should not be undertaken if such replenishment cannot be completed quickly so that the equipment is readily available for crash rescue work.

In order to completely cover all the problems involved in runway foaming procedure, herewith is a reprint of the **NFPA Bulletin No. 420-M.** This bul-

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tin represents the collective efforts of the NFPA Aviation Committee, on which your ALPA representatives serve.

Foaming Runways for Crash Protection

I Introduction

11. A number of aircraft emergencies (mostly wheels-up landings or aircraft with defective nose gear) have occurred at airports where foam has been applied to runways with the thought that such action would mitigate the extent of damage likely to result and reduce the likelihood of fire occurring following the impact. A number of these operations have been successful. Likewise, a number have not accomplished their purpose and appear to have been inadvisable (in most of these latter cases, aircraft have missed or overrun the foam blanket). During the same time period, and prior thereto, similar aircraft emergencies have occurred at airports on runways not coated with foam and in a number of these cases no major fires have occurred and the damages sustained by the aircraft have been moderate.

12. The U. S. military services did much of the original work in connection with foaming of runways for crash protection and likewise have done much to advance the technique. The practice has also spread to other countries. It is also true that this idea has been advanced significantly by the publicity given to a number of isolated incidents, by television and newspaper glorification of the technique, and by the psychological and theoretical advantages which the technique seems to inspire.

13. Unfortunately, it has not been possible to date to conduct full-scale tests of wheels-up aircraft landings on various types of runway surfaces with and without foam coatings. To evaluate the technique at this time, therefore, it is necessary to apply the test data that are available, to analyze aircraft impact behavior from actual incidents of record (where foam has and has not been used), and to relate the use of foam for this purpose to its known qualities.

I Theoretical benefits of foaming runways

21. There appear to be four basic possible benefits from foaming of runways for crash protection. They are:

a. Reduction in extent of aircraft damage. That the foam will reduce the extent of damage to an aircraft which may be forced to make a wheels-up emergency landing, or, where the nose gear is defective.

b. Reduction in deceleration forces. That a foam coated runway will reduce the coefficient of friction and thus decrease (by permitting slippage) either the deceleration forces imposed on the aircraft and its occupants or its ground looping tendencies.

c. Reduction in friction spark hazard. That the foam or water retained by the foam at the runway interface will reduce the known friction spark hazard of certain aircraft metals on dry runways. Such friction sparks constitute a possible ignition source following impact-imposed damages to an aircraft's fuel tanks or system.

d. Reduction in fuel spill fire hazard. That a foam coated runway will reduce the extent of the fire hazard in the event of a fuel spill following impact-imposed damages to an aircraft's fuel tanks or system.

III Analysis of theoretical benefits

31. Analysis of the four basic possible or theoretical benefits described in Section II on the basis of the test data available and the experience record to date leads to the following conclusions:

a. Extent of aircraft damage. A number of well executed emergency landings on foam coated runways have been accomplished with minimum damages to the aircraft involved. Unfortunately, these incidents do not prove that, conversely, the damage would have been appreciably greater had no foam been used. Controlled emergency landings on dry runways have also been completed with relatively minor damages to the aircraft. A number of variables are indicated:

(1) the design of the aircraft (such factors as "crush-resistance" of the fuselage, whether the aircraft is of high or low wing design, the hazard presented by propeller fragmentation, etc.);

(2) the skill of the pilot (his ability to land the aircraft under emergency conditions, either by virtue of his training, his psychological or his physical state at the time the emergency occurs);

(3) the type and condition of the runway surface;

(4) the landing weight of the aircraft;

(5) the weather, temperature and visibility conditions, etc.

To date, no incident has occurred where foaming of the runways has increased the extent of damages so about all that can be said is that, under favorable conditions, foaming of the runway should not result in greater aircraft impact damages. No test data are available which permit a more complete evaluation of this feature.

b. Extent of deceleration forces. From what is known to date, the normal braking ability of aircraft on wet runways will be affected only slightly from the use of foam on runway surfaces, assuming non-freezing weather.

c. Reduction of friction spark hazard. Scale research tests have shown that aluminum alloy metals produce no friction sparks of igniting aircraft fuel vapors under the simulated bearing pressures and contact speeds likely to be encountered in actual aircraft emergencies on either dry or wet (foam covered) concrete or asphalt runway surfaces. According to these same scale research tests, foam, properly applied, is capable of holding a water layer at the runway interface which is effective in suppressing sparks in from 57 to 100 per cent of the tests where magnesium alloys, stainless steel and other aircraft steels produced sparks capable of igniting aircraft fuel vapors from friction with dry asphalt or concrete runways. Titanium friction sparks capable of igniting aircraft fuel vapors could not be effectively suppressed by runway foaming in any of the scale research tests and constitute the greatest hazard. The roughness of runway surfaces was found to be a factor in the production of the incendiary sparks generated by abrasion of all the metals (except aluminum) and the friction impact with expansion joints between concrete slabs was found to result in momentary increases in the energy release from the sparks.

d. Reduction of fuel spill fire hazard. From all that is known of the fire suppression qualities of foam and the scale research tests, it is clear that a foam coated runway would have no appreciable effect on the fire hazard of fuel vapors in the atmosphere over the foam. These vapors could still be ignited above the foam blanket by an engine fire, electrical arcs or sparks, static discharges, or other ignition sources. However, a pre-laid foam

We wish to express our thanks to Mr. H. B. Peterson of the U. S. Naval Research Laboratory, Washington, members of his staff and other interested parties whose cooperation helped make this report on runway foaming possible.

Captain Victor Hewes
Captain William Collier

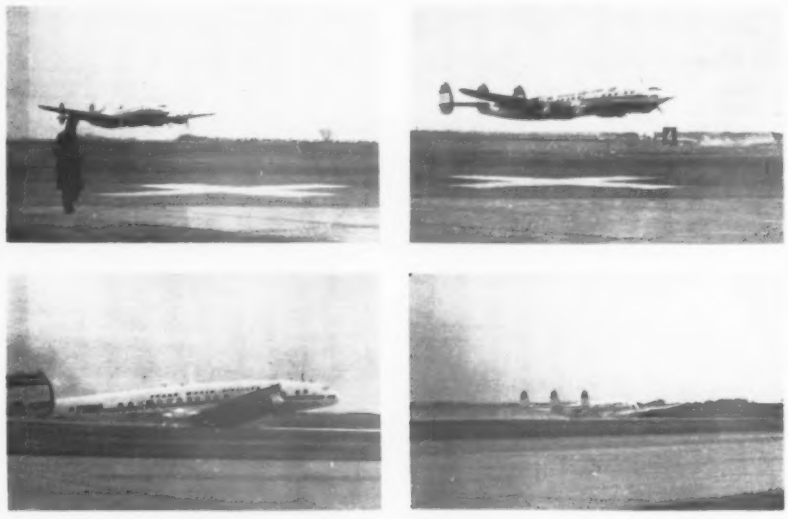


***PHOTO SEQUENCE** of a gear up landing on a foam-covered runway which occurred in January 1959, at the Naval Air Station in Olathe, Kansas. The plane came to rest about 2,000 feet from the point where it touched down safely.* *U.P.I. Photo*

blanket has substantial value in reducing the fire hazard. Should liquid fuel be released over the foam blanket, it will fall through and spread under the foam layer. The further the release of flammable vapors will thus be materially reduced by keeping much of the fuel surface covered. In case of vapor ignition, the foam will reduce flame intensity by reducing the burning area. This will also provide greater operational freedom in the placement of rescue and fire fighting equipment in the vicinity of the disabled aircraft after it comes to rest.

32. From the above analysis, it can be seen that foaming of runways for crash protection involves variables not easily assessed in advance of the incident and that its effectiveness in reducing the friction spark and fuel spill hazards likewise cannot be guaranteed. On the other hand, any possible means of mitigating the impact severity or the crash hazard should not be overlooked.

IV Operational problems

41. There are other considerations which should be evaluated to determine the feasibility of using foaming of runways for crash protection in any individual case. they are:

a. The actual nature of the airborne emergency; i.e., whether the aircraft cannot lower its main gear, whether only one gear is down and cannot be retracted, whether one or more tires or wheels have been damaged or lost, whether the nose gear is "cocked," or a combination of one or more of these circumstances or some other related condition exists.

b. The time element available for accomplishing the production and distribution of the foam covering (which may take up to an hour or more). This will be related to the nature of the aircraft emergency (the safety factors involved in the aircraft remaining airborne during the foam laying operation), the number and the nature of the foam making appliances available.

Note 1: Airports not having adequate equipment should not attempt to lay a foam blanket unless mutual aid assistance from neighboring fire departments can provide the needed assistance.

Note 2: Other air traffic must be considered unless alternate landing areas are available.

Note 3: Normally the time required to lay a runway foam blanket permits the dumping of fuel by the air crew (where considered necessary or desirable) to reduce the hazard during the emergency landing.

c. The reliability of information on the landing techniques to be used. This will be related to wind and visibility conditions, pilot experience and skill, runway instrumentation factors and aircraft operational problems under the existing emergency conditions.

d. The foam making capability of the equipment available on the airport plotted against the prudent holding in reserve of supplies for any alteration in the emergency conditions existing at the airport during the foam laying operation and the facility for reloading the equipment prior to aircraft touchdown as may be considered essential to safeguard any subsequent fire which may develop.

Note: At airports where foaming of runways is programmed as may be required (see Paragraph 44) preplanning will be necessary to assure the availability of adequate foam liquid concentrate to meet this need in addition to the normal quantities required for fire control and training purposes.

e. The effect the foam laying and clean-up operations will have upon the aircraft movements at the airport and how this will affect the safety of all aircraft operations in progress.

f. Whether the ambient temperature conditions make the laying of a foam blanket feasible. During very cold weather, freezing could create a serious problem because of freezing of the liquid content of the foam on the cold runway surface. The foam itself would be slow to freeze but the formation of ice beneath the foam would be undesirable if subsequent aircraft braking was to be attempted and for further normal use of the runway after the emergency was over.

g. The length of the runway and the nature and condition of the runway surface at the time the emergency occurs.

42. Considering the factors mentioned in Paragraph 41, it is clear that initiation of a request to foam a runway for any given flight emergency situation should be a flight operational decision. The request to take such action should thus come from the pilot in command of the aircraft or the aircraft operator, assuming that they are familiar with the aforementioned considerations.

43. Determination as to the feasibility of applying foam to a runway is a decision which the airport manager or his representative (the chief of the airport fire department) must make after receipt of the official request for such services from the pilot or operator and an evaluation of the fire protection and other airport operational problems involved.

44. The designation of one airport in a region or predetermined geographical area to which aircraft might be safely dispatched when in need of runway foaming is recommended. Selection of these regional airports should be based not only on the availability of adequate runway foaming equipment and supplies, emergency aircraft rescue and fire fighting services, and allied support services (cranes and aircraft repair services), but also on the physical conditions of the runways to be employed, the climatic conditions, aircraft traffic interruption effects, and the security of the airport to assure control of curious spectators in event of public awareness of the impending emergency landing.

V Techniques of runway foaming

51. After evaluating the theoretical and operational problems involved as discussed in Sections II through IV, if foaming of a runway is to be accomplished in an attempt to safeguard a particular emergency landing, the following recommendations are advanced for consideration by those responsible:

Note: Each case will differ depending on the numerous variables involved, but the following basic principles are important considerations.

a. That radio contact be maintained between ground crews laying the foam on the runway and the pilot of the distressed aircraft to assure full understanding and knowledge of the operating plans and the protection established.

b. That wherever possible auxiliary tank trucks equipped to dispense foam through ground sweep nozzles or special booms or nozzles be used to lay the foam blanket in lieu of using the primary aircraft rescue and fire fighting vehicles so as to maintain the capabilities of the latter to be operational for the longest period of time.

c. That a time study be conducted prior to any emergency to work out the scheduling of the foam laying operation and the vehicle reload requirements. Under any condition, adequate extra quantities of foam compound must be preplanned and prearrangements made for rapid vehicle re-servicing.

d. That under no conditions should a foam protective blanket be applied to a runway surface if time limitations or physical conditions would prevent all available aircraft rescue and fire fighting vehicles from being fully operational at time of the actual touchdown with an adequate supply of foam concentrate available to use the vehicles to their full capacity.

e. That the location of the foam wetted surface in relation to the runway threshold be determined by recommendation to the ground crews by the aircraft pilot in charge with the starting point established by aircraft operational problems, the nature of the runway surface, the length of the runway and the amounts of water and foam available.

f. When visibility conditions are such that the pilot cannot distinguish from the air where the foam applied to the runway starts, a reference point should be established in a clearly distinguishable manner to indicate where the foam pattern commences to aid the pilot in getting the aircraft positioned for the landing.

g. All unnecessary people, press and photographers be advised to stay clear until all evacuation and occupant counts have been accomplished and full fire control or fire preventive measures taken. (This is a function of airport police or guards as may be augmented by local police and volunteers.)

h. The length, width and depth of the foam pattern will vary with the type of emergency, the type of aircraft, the length of the runway, the quantities of agent available, and the time factors involved. For purposes of estimating foam liquid requirements and water supply needs to foam 20,000 square feet of runway surface with a foam blanket of two inches in depth (assuming level surfaces, a foam expansion of 10, and a 6 per cent strength foam solution mixture), 2,333 gallons of water and 149 gallons of foam liquid concentrate would be needed. For a malfunctioning main gear or wheels-up landing, the runway foam pattern should be at least as wide as the distance between the outboard engines of the aircraft involved plus a safety factor of 10 feet on each side. For this type emergency, the foam pattern should be laid down the center line of the runway beginning at a point

Continued on page 25

THIS VISCOUNT slid to a safe, gear-up landing on a foam covered runway last month. The photo made shortly after the foam had vanished, reveals relatively little damage sustained by the aircraft.

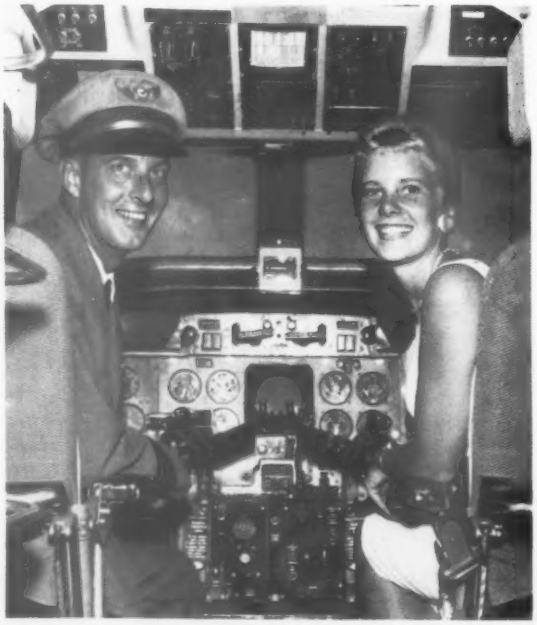
Associated Press Wirephoto

ALPA Region I meeting held in Long Island, N. Y.

REGION I meeting was held Aug. 16, in Garden City, L. I., with ALPA President Sayen and regional officers in attendance. (Mr. Sayen is addressing the meeting in photo above.) A similar meeting was also held in Boston. Items on the agenda were open to discussion (photo, left).

Daughter of NOR captain named "Miss Minnesota"

North Central Airlines Photo



GIVING 'Miss Minnesota' a tour of a North Central Convair 340 is Capt. Ralph Parkinson. This is something of a special visit, for the young lady is the pilot's 18-year-old daughter Nancee. Although Nancee is studying to become an elementary teacher, she admits that she hopes to spend some time as an airline stewardess — with North Central, of course.

EAL senior captain dies in his Miami, Fla., home

Capt. Warner

Captain Norman K. Warner, manager of flight operations and ground school training, for Eastern Air Lines, died August 26. A former senior captain for Eastern, he had been appointed to the personnel training position two years ago.

Captain Warner's untimely passing at the age of 52, was an outcome of a heart condition. In his lifetime Captain Warner was noted for doing an outstanding job on any duty assigned to him. He achieved the rank of liteutenant colonel in the Air Force.

Associates of Captain Warner knew him as a versatile man. In addition to his full time responsibilities with Eastern, he served as a technical consultant to a private company and still found time for his hobbies.

He was a resident of Miami for the past three years. Surviving him are his wife, two sons and a daughter.

PAA council helps widow of weather ship crewman

As a token of their appreciation of the services of the men who man the weather ships of the North Atlantic, members of ALPA Council 36, Pan American World Airways, made a voluntary contribution of one hundred dollars to the widow of Mrs. John Corrigan. John Corrigan was a crew member of a weather ship which was lost at sea during a storm last August.

In a letter to Mrs. Corrigan who lives in Elderslie, Renfrewshire, England, J. W. Fluharty, finance chairman of Council 36 wrote, "We wish you to know that we very considerably depend on the fine work done by the men on the weather ships over which we fly. Very recently we learned of the tragic loss of your husband at sea and extend to you our most sincere sympathy."

*(By coincidence the story of these weather ships "ICAO Ocean Stations at Work" appeared in the August, 1961, issue of this magazine.—*EDITOR.)

An address by C.A.B. Chairman, Alan S. Boyd

Traffic rights for scheduled international air carriers

In exchange for the right to fly to foreign nations, the United States Government allows foreign carriers to land in this country. However, there are more American citizens going to foreign destinations than foreign citizens coming to the U.S.A. Some foreign air lines are using their excess passenger capacity to engage in ruinous price-cutting to the detriment of American air carriers. Chairman Boyd calls for a reappraisal of these agreements.

THE so-called "Chicago Convention," which has been amended in only a few relatively minor particulars since its adoption in 1944, is the principal instrument of international public air law. It is subscribed to by almost all the nation states of the world. The U.S.S.R. and Red China are the two big exceptions.

The conference which drew it up was called near the end of World War II. Its main object was to define the rights and duties of countries toward one another in respect of civil aviation. The convention superseded earlier regional ones going back to 1919. It was hoped to produce a document which would enjoy global acceptance. That has nearly been achieved.

Article 1 of this Convention in International Civil Aviation states that, "The contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory." This repeats a principle contained in earlier treaties and in the national law of the United States and of every other country in the world, including the U.S.S.R. and Red China. There are no servitudes on this sovereignty imposed by international law through custom or otherwise, such as those impressed on a nation's sovereignty over its territorial waters, through which foreign vessels may move under certain conditions without prior permission. Historically, seagoing vessels may enter foreign ports for commercial purposes with reasonable freedom. Such is not the case with aircraft. Each nation's sovereignty over its superjacent airspace is absolute. Entry into it for scheduled international air services must be negotiated for. This is made explicit in Article 6 of the Convention. Negotiation for scheduled international airline commercial or traffic rights is the subject of this talk.

C.A.B. Chairman Alan S. Boyd
U.P.I. Photo

International traffic rights

I will not go into the background and reasons behind the sovereignty principle and the requirement to negotiate for certain rights. That would take up all the time allotted me and at best would serve merely to inform you. My object is both to inform and worry you; so I shall treat with practices under the requirement. We will be concerned here with traffic rights for scheduled international air services only. Non-scheduled or charter flights, and private or noncommercial flights are provided for within express terms of the Convention, which in general are not too restrictive. Purely operational rights, such as transiting through a country's airspace, or landing solely for technical non-traffic purposes such as refueling, are granted fairly freely and are the subject of a widely accepted multilateral treaty known as the "International Air Services Transit Agreement."

We, the United States, endeavored at Chicago to obtain wide agreement on a multilateral transport treaty which would have provided for broad commercial rights to be exchanged amongst participants, subject, amongst other things, to an understanding on capacity to be provided by international airline companies. The subject of capacity I shall advert to later. We failed in this effort and afterwards withdrew from the Transport Agreement ourselves. In the absence of a multilateral agreement on economic control of scheduled international air transportation, it became necessary for us and other nations to enter into a series of bilateral agreements. We are signatory to dozens of such agreements with individual countries throughout the world. It is by virtue of these agreements that our scheduled airline companies operate abroad, and that those of other countries serve United States territory.

Basic "Bermuda Agreement"

Most important of these agreements, because it serves as a model for most others, is the Anglo-American Air Services Agreement concluded at Bermuda in 1946. It is known as the "Ber-

This article based on a speech by Alan S. Boyd before the Commonwealth Club of California, July 14, 1961, in San Francisco.

muda Agreement." It has been amended extensively over the years by route changes and additions, but the principles enunciated therein have hardly been touched, including the capacity clause. The same applies to the many other bilaterals based on Bermuda.

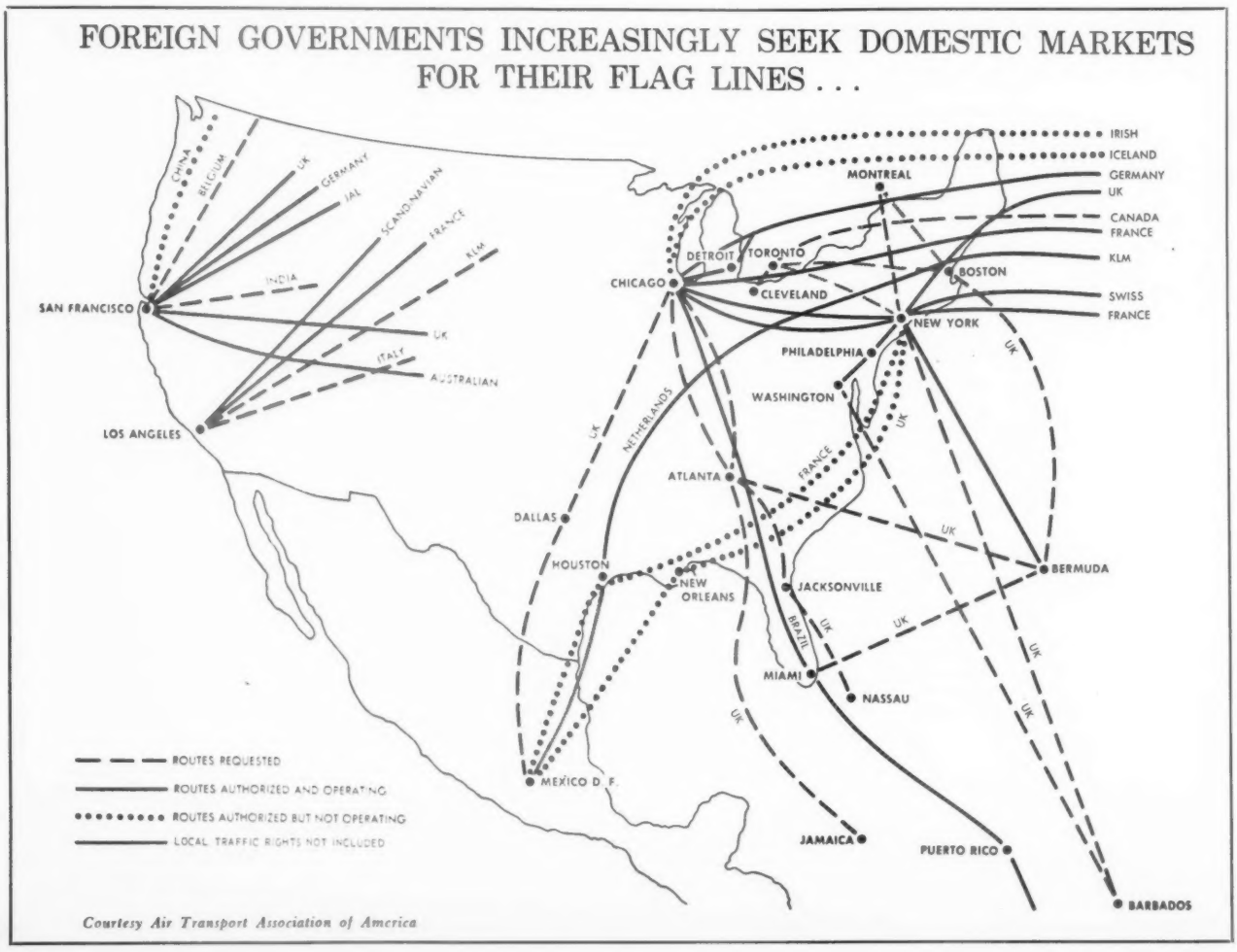
Basically what we sought to do was to provide for a fair exchange of economic benefits. This we did by permitting foreign flag carriers to serve specified cities in our country in return for rights for our flag carriers to serve cities abroad within the territory of each country with which we negotiated. Since the United States is by far the greatest national reservoir of international air passengers, of necessity we permitted foreign airlines of any given country to enter a greater market than we in turn penetrated in that country abroad. Since there must be two ends to an airline route, this could not be avoided.

The imbalance in market exchanges did not work adversely to our interests for some years because just after the war, we were in a far better position to exploit markets available to us than the foreign carriers were to exploit the U. S. market. We had the latest transport equipment, skilled personnel and money. It has taken the leading airlines from abroad some years to catch up, but they are doing it. Now we find that we are too frequently being taken advantage of. It was bad enough having to trade rights in our great markets for rights in lesser ones elsewhere, but our commercial and other interests dictated that we do so. In addition, however, we are currently suffering from excessive capacity competition on the one hand, and restrictions on our capacity on the other.

The problem of capacity

The time has come to explain this capacity business. To understand it, you must first be familiar with the "five freedoms" of the air. The first two I have already touched on: they are the right to transit the airspace o a foreign state, and the right to mak landings for technical purposes only The third, fourth and fifth freedom are commercial rights. The third an fourth permit the airlines of any tw contracting states to carry traffic orig inating in either of the contractin states and terminating in the other. I is the third freedom if the traffic is en planed on a carrier in its own country and carried to the other. It is fourth freedom if the traffic is enplaned on a carrier in the other country and carried to its own. Fifth freedom is the bogey. This is the carriage of traffic, that is passengers, goods or mail, between a terminal in the territory of one contracting party and a terminal in the territory of a third country by the carrier of the other contracting party.

I will illustrate the three freedoms by way of examples. Let us use the Bermuda or Anglo-American Agreement. Third freedom would be the carriage of traffic on a U. S. carrier



Courtesy Air Transport Association of America

riginating in U. S. territory and terminating in U. K. territory, or the carriage of traffic on a U.K. carrier originating in U. K. territory and terminating in U. S. territory. Fourth freedom would be the carriage of traffic on a U. S. carrier originating in U. K. territory and terminating in U. S. territory, or the carriage of traffic on a U. K. carrier originating in U. S. territory and terminating in U. K. territory.

Fifth freedom would be where a U. S. airline carried traffic between a U. K. point and a point in a third country as terminals, or where a U. K. airline carried traffic between a U. S. point and a point in a third country as terminals. This traffic is troublesome to treat with fairly because at base it is traffic which under the terms of the bilaterals is primarily for the carriers of the countries between which it is travelling. So, if a U. S. air line carries traffic moving between the U. K. and Cairo, for example, it is carrying it under fifth freedom rights, wheras a U. K. or Egyptian carrier would be carrying on a third or fourth freedom basis, which is what we call primary justification traffic. Under Bermuda-type agreements, traffic moving between any pair of countries is considered to be primarily available to the air carriers of those countries, and only secondarily available to others operating between those two countries in the course of a through flight.

The Bermuda and similar bilaterals state that services provided by a designated air carrier shall retain as their primary objective the provision of capacity adequate to the traffic demands between the country of which such air carrier is a national and the country of ultimate destination of the traffic.

Capacity means the number of passenger seats offered for sale, or amount of space or weight offered for cargo in a given time, per day or per week for example. Capacity offered is supposed to bear a relationship to the carrier's primary justification markets, that is to its third and fourth freedom traffic. Only incidentally is the carrier to pick up fifth freedom or third country traffic, although it is entitled to carry a reasonable percentage of such traffic.

Foreign inroads

The alarming thing is that a number of foreign carriers are offering services far beyond the needs of their primary justification markets. They are cutting into the markets of others, including the U. S. especially, contrary to the terms of our bilateral agreements with them as we understand those terms. This is markedly true of several Western European carriers and at least one Asian carrier which are offering many more services to the U. S. than are justified by their rightful share of the total traffic under the Bermuda scheme of things. By this device, they hope to divert other carriers' third and fourth freedom traffic to themselves. Excessive capacity over given routes can only result in uneconomic operations, which is precisely what is plaguing many airlines today.

Our carriers are managing to hold on to a large percentage of their primary justification traffic, but heavy inroads are being made into it improperly in my view. Despite capacity discussions with several foreign governments, we have not been able to convince them of the propriety of our arguments and the impropriety of their carriers' excessive services. The situation is becoming increasingly serious with the augmentation of large jet services over the Atlantic notably. We stand ready at all times to review the capacity offered by U. S. flag carriers, and are prepared to give assurances that it will not exceed that amount envisaged in our agreements. Indeed, the vast percentage of the U. S. carriers' business is third and fourth freedom traffic, originating or terminating in our own territory. The same simply cannot be said for a number of foreign airlines operating to this country, which makes for wasteful and uneconomical competition contrary to the bilaterals.

As if this were not trouble enough, we are also suffering from the reverse situation, particularly in Latin America. There we are arbitrarily being shut out of fifth freedom markets beyond reason. That is to say we are not even being allowed to carry an amount of such traffic which bears a reasonable relationship to our third and fourth freedom traffic. And in Latin America and elsewhere, some governments are trying to restrict the number of services offered by U. S. carriers despite the fact that they can be justified by indisputable third and fourth freedom traffic statistics. This is an attempt to pre-determine capacity, even though the historical interpretation of the Bermuda language makes it clear that capacity is subject to **ex post facto** review, not pre-determination.

Reappraisal of agreements

As time goes on, as more new counties bring new carriers into world markets, as the existing companies expand their services with modern jets, these problems and the attendant ineconomy they produce, become more and more aggravated. Something must be done to correct the situation. Obviously we cannot sit idly by and watch the economy of a vital industry be destroyed by the ineconomy or impropriety of its foreign counterpart. We will have to take drastic action. There must be a reappraisal of our agreements and the conduct of all parties under them.

With great foresight, our President recently instituted a project, known as Project Horizon, to determine U. S. aviation goals for the next ten years at home and abroad. A report will probably be made to him this month, and no doubt we can expect action to be taken quickly on it. Surely our problems will not be solved in a day, and very likely further and continuing study will be necessary to arrive at equitable solutions. We who have direct responsibilities in this area welcome the opportunity to assure our

(Continued on page 27)

"Listen, buddy, we don't care how much it costs or where we go so long as we can be close to our baggage!"

Boeing Company Photo

THE air transport system and the aviation industry of the United States are vital factors in our national economy and welfare and an integral link in the security of this Nation. Thousands of passengers and millions of pieces of mail and valuable cargo are transported daily by America's air lines. No industry performs a greater public service to our citizens.

But in the performance of this vital service, the noise created by aircraft has in some instances caused strained relations between airports and the communities which surround an airport.

Manufacturers have expended millions of dollars developing jet engine noise suppressors. Air carriers are accepting substantial reductions in revenue loads due to the weight added by the use of noise suppressors and the additional fuel required to carry them. Air line pilots are, within the limits of safety, adhering to all noise-reducing procedures and pilot techniques as they are introduced. However, as the frequency of air transport operations increases and jet service is extended into new areas, the problem of noise is becoming more widespread.

The scope of the problem requires the combined effort of the pilots, the

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This article is based on material supplied by the National Aircraft Noise Abatement Council with Captain Charles C. Spencer, who is the ALPA representative on the NANAC Technical Committee, serving as consultant.

THE SOUND LEVEL of a Boeing 707 taking off with maximum engine thrust was studied prior to the plane's introduction to air line service; the data being useful in planning operation of the craft particularly over urban areas. This photo was taken 10,500 ft. from beginning of the takeoff. Microphones in foreground were wired to sound measuring and recording equipment.

THE PROBLEM OF AIRCRAFT NOISE

Air transportation plays a vital role in the nation's economy and security system but in performing this service, the industry has the complex noise problem which exists in some areas between the airport and its adjacent communities.

airlines, the manufacturers, the Federal Aviation Agency, and the airport operators. The Air Line Pilots Association, the Air Transport Association of America and the Aerospace Industries Association have formed the National Aircraft Noise Abatement Council (NANAC) to coordinate the development and implementation of safe, practical, industry and federally acceptable, national aircraft noise reduction criteria, standards and procedures.

The purpose of this article is to acquaint the air line pilot with the many factors which make up the aircraft noise problem. A useful starting point is the character of noise itself.

What is noise?

Defined technically, sound is a form of energy in the air—vibrations that enter your ear and make you hear something. A simple definition of noise is "unwanted sound." But almost every conceivable sound can be at one time welcomed, at another time abhored.

In order to describe sound sources for comparative purposes and to measure them the "decibel" (db) is a popular unit. The starting point of this reference scale is "0 db" which is about the level of the weakest sound which can be heard by a person with good hearing. The measuring scale is logarithmic which means of course, the increase from 10 db to 20 db is an increase of 10 times rather than twice as much. (Figure 1 shows the relative intensities of various common sounds.)

But it should be pointed out that noise is a relative matter. The sound of dripping water at night may be more bothersome to a person than the auto traffic which goes by his house. The frequency of a sound may be an irritating factor to a listener. People may be disturbed by unusual sounds. Residents near an airport might ignore a piston aircraft noise but complain about the whine of a turbine engine. Thus, the problem of measuring "noise" or even defining it, becomes complex.

Predicting the way sound will travel is at least as complicated as predicting the weather. In fact, the weather plays an important part in the way sound travels. Wind and temperature gradients bend sound. Turbulence and humidity cause scattering and absorption of sound. Temperature inversions and clouds tend to bend the path of sound back towards the ground and generally promote strong noise propagation. The contour of the terrain, buildings, trees, grass, all tend to affect the propagation of sound. This means that loudness in a given area will vary sharply simply because of the number of unpredictable variables.

There are four sources of noise on or near airports:

1. Aircraft taking off and landing, and operating in the traffic pattern.
2. Aircraft undergoing engine maintenance run-ups.
3. Engine test stands (at major overhaul bases).
4. Various ground power units, machinery and people.

Control of noise

Every noise problem breaks down into three component parts:

1. A *source* which radiates the sound,
2. A *path* along which the sound travels, and
3. A *receiver* (which in our case is the human ear).

Figure 1

Relative Intensities of Various Common Sounds Expressed in Terms of Decibels and in Terms of Their Absolute Relationship

Decibels	Degree of Noise Intensity*	Source or Type of Noise**
160-170	10-100,000,000,000,000,000	J57-Type Engine w/afterburner
150	1,000,000,000,000,000	A4D at Take-Off (J65 engine)
140	100,000,000,000,000	F3D at Take-Off (J34 engine)
130	10,000,000,000,000	F84 at Take-Off (80′ from tail)
120	1,000,000,000,000	DC-7 Take-Off (150′ from tail)
110	100,000,000,000	Thunder
100	10,000,000,000	Boiler factory
90	1,000,000,000	Large truck—unmuffled
80	100,000,000	Street corner traffic, large city
70	10,000,000	Conversational speech (3′)
60	1,000,000	Typical office—ambient noise
50	100,000	Private business office
40	10,000	Quiet home—average living room
30	1,000	Theatre, no audience
20	100	Studio for sound pictures
10	10	Quiet breathing in anechoic chamber
0	1	Average threshold of hearing

** Expressed in terms of the average threshold of hearing.*

*** All examples are computed at a distance of twenty-five feet unless otherwise indicated.*

The control of noise at its *source* is an engineering and operational problem to be solved by modifying or redesigning the source, or by reducing the noise output by reducing the power output. Jet engine suppressors, which reduce noise by altering the flow of exhaust gases, is one example, and the reduction of total power output in climbs is another example of this kind of control.

Noise reduction *along the path* can be accomplished by increasing the distance between the source and the receiver, by using baffles such as convenient hangars, terrain features, wide bands of trees, etc.

Noise control *at the receiver* is more difficult and complicated because in our case the receiver is a person, subject to all human variables, annoyances and prejudices. While two parts of the total problem—the sources and the path—can be attacked by engineering means, flight procedures and pilot techniques, the third, the receiver, can only be affected by removing him from the noise area, by isolating him from the noise by the use of soundproofing and air conditioning, or by educating him through means of community relations programs to understand and accept certain irreducible levels of noise as necessary for the common good of the nation and his community.

Manufacturers' role

Present day commercial jet aircraft and their power plants are direct descendents of military aircraft in which the noise factor is not a problem. Manufacturers have spent some $50,000,000 to develop suppressors which produce substantial reductions in jet engine sound output.

Other developments are turbofan engines which are more powerful and are quieter per pound of thrust. A system of resonators and sonic barrier devices are promising devices for reduction of sound level of engines.

Research is also being conducted to develop vertical and short takeoff aircraft whose high performance will enable them to climb almost vertically to a noise abating altitude within the airport boundary.

Action of air lines

The air lines have taken action to reduce the noise problem. For example, training is done at remote airports to reduce the number of jet flights into noise sensitive terminals.

In January, 1961, there were 207 pure jets in operation on air lines equipped with sound suppressors which cost the carriers $49,000,000. The carriers accepted a $25,000,000 yearly revenue loss and added operating costs to use suppressors; this is $10,000 cost per aircraft per month.

Another costly item for the air lines has been ground noise suppression equipment at principal bases and maintenance depots.

Airport operators

Airports have a strange attraction for real estate developers. Though many airports were once out in the country ultimately homes and commercial structures will be built right up to the airport fences. A 264 unit apartment house has been planned near the San Francisco International Airport next to what has been described as, "the worst sound problem area in the vicinity of the airport."

But airport operators have tried to accommodate their neighbors by reducing the sound levels. For example, by extending runways and clear zones to increase the distance between the airport and the neighbors. Or constructing new runways to direct air traffic away from inhabited areas. Maintenance areas have been moved as far from noise sensitive developments as possible.

Airport operators are currently developing long-range plans including zoning, sound-proofing and buffer areas to prevent development of future noise problems.

Just how much noise does an airport create? The *Los Angeles Examiner* assigned a team of reporters to the task of finding the noisiest place in Los Angeles. General background noise created by traffic and normal city sounds was placed at an average of 66 decibels.

Truck traffic along the freeways produced average readings of between 80 and 100 decibels. Half a block away on residential side streets, this traffic still produced readings as high as 90 to 95 decibels.

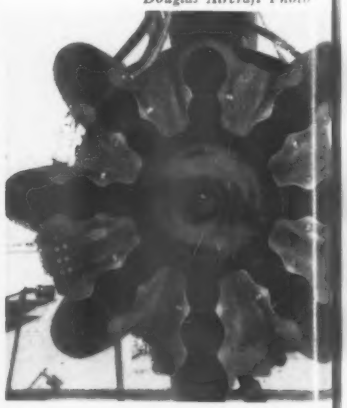
When checking the levels of aircraft noise near Los Angeles International, they took a reading adjacent to the airport fence under the final approach; the highest reading was 98 decibels made by piston aircraft. Jets in the

***PRIOR TO THE INTRODUCTION** of jet aircraft to scheduled air line operations, the manufacturers of aircraft spent considerable time and money seeking ways to reduce the noise of jet engines. These photos show the various configurations tested for sound suppressors. Manufacturers have spent $50,000,000 to develop the suppressors now in use. These suppressors cost the air lines an additional $240,000 per aircraft.*

Boeing Company Photo

Boeing Company Photo

Douglas Aircraft Photo



ıme area produced only 94 decibels on ıe rating scale. Ten blocks away, still nder the approach path in the area, ıey described as "one where jet air- raft supposedly make life unbearable hen they land and take off," neither ets nor piston engine aircraft regis- ered more than 67 decibels on the cale.

Under the takeoff path, the highest ating for a civil jet was 96 decibels ut a piston engine aircraft topped this with 97. The highest rating of all, 103 decibels, was produced by two unsup- pressed Air Force jets taking off in formation.

Governmental action

There are legal approaches to the noise problem (and legalities which complicate the pilots' role and impose restrictions on flying procedures).

The Federal Aviation Agency has taken a number of steps. It has estab- lished special offices in Washington and regional offices to handle noise prob- lems. These offices work with Noise Abatement Committees established by NANAC member organizations. FAA develops preferential runway systems to avoid takeoffs and landings being made over inhabited areas whenever wind and weather conditions permit. FAA has developed special air traffic rules for noise abatement.

The FAA has also been active in de- veloping guides to indicate noise critical areas around airports in which housing should be excluded. Closely related to this is the fact that federal money may go into housing programs, public works, etc., near airports and presumably other federal agencies take their cues from the FAA on whether certain projects go through.

In July, 1961, the FAA indicated hat it is analyzing a tentative proposal or a joint FAA-NASA-USAF project o investigate causes of jet engine noise.

Municipal governments have ap- proached the aircraft noise problem by ttempting to frame ordinances which would control the movements of air- raft and zoning measures which would eep housing, schools, hospitals, etc., ut of critical noise areas in the vicinity f airports.

However, through a series of legal pinions, state and local officials as well s the courts have recognized that the ederal Government has the sole power o regulate air traffic. This does not nean, however, that to a large extent, noise problems at airports may not be olved best by the cooperative efforts of hose involved. Nor does it mean that ocal government may not substantially

***JET EXHAUST NOISE SUPPRESSOR** in position on a jet aircraft. In addition to reducing jet roar, the unit also protects ramp personnel and prevents hot exhaust gases from eroding paved surfaces.* *General Acoustics Corp. Photo*

increase the public acceptability of air- ports by the enactment and enforce- ment of suitable zoning laws governing the use of property around airports.

Thus, a municipality's major con- tribution to noise abatement is in the area of wise zoning laws and city plan- ning which would take into account the present and future trends in civil aviation.

The issue of property values around an airport is a recurring theme in a discussion of local aircraft noise prob- lems. The issue might puzzle an im- partial observer: real estate developers are attracted to the open spaces around an airport, then after building literally up to the airport fence, property own- ers in this area will complain that air- craft noise is "lowering property val- ues." The evidence indicates that property around air terminals rises rather than falls.

Pilots cooperate

Pilots have the prime responsibility for the safety of their aircraft and its passengers. Their sound professional judgment must prevail in establishing procedures and techniques for minimiz- ing aircraft noise without compromising safety. Pilots have taken the lead in techniques and procedures for:

- power and flap settings to mini- mize noise output in airport areas.
- turns to avoid residential areas where possible.
- attaining maximum altitude as soon as possible after takeoff and main- taining maximum altitude as long as possible before beginning final descent.

Conclusion

In a House Committee on Science and Astronautics hearing on the aspects of present and future aircraft noise problems, the consensus was that the problem was presently scientifically un- solvable. Most witnesses expressed the belief that rigidly adhered-to-noise abatement programs (backed up by good community relations programs) were the only immediate methods known to mitigate the annoyance and enlist public understanding and accept- ance of irreducible noise levels.

Lead witness, Doctor Richard H. Bolt, Associate Director (Research) of the National Science Foundation, who

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Courtesy Captain B. V. Heacock

HOW THE AIR FORCE TRAINS FIRE FIGHTERS

The report of the Chairman of the ALPA Detroit Area Fire & Rescue Committee who recently attended the Air Force Fire Protection Specialists School of Greenville AFB, Mississippi

By CAPTAIN D. A. HEINE
Chairman, Detroit Area Fire & Rescue Committee

THROUGH the combined efforts to ALPA's Air Safety Department and Headquarters Air Training Command, United States Air Force, I was privileged recently to attend the Air Force Fire Protection Specialist School. This school, located at Greenville Air Force Base, Mississippi, is the only one of its kind in the Air Force. It has the primary objective of taking airmen who have had little or no experience with fire and giving them the necessary knowledge to operate the Air Force crash equipment. It also teaches the fundamentals of successfully combating crash fires with the primary objective of rescuing the crew and occupants of the aircraft involved.

In this report I shall attempt to express some of my observations and some of the knowledge gained at this school. These observations are based on extensive personal contact with the staff of instructors at the school in addition to the observance of 14 simulated crash fires. The instructor staff had a common background of experience in actual crash fire fighting in both the Air Force and Navy, ranging from five to fifteen years.

Description of school

The program consists of a seven week training period devoted to both classroom work and actual fire fighting experience. The classroom work is devoted to the basic indoctrination to the ingredients of fire, i.e. heat, fuel and oxygen, and continues through the operation of all types of Air Force crash equipment. The actual training in crash fire fighting is presented at the end of the course, utilizing most types of the equipment. The training is conducted using aviation gas as the fuel and an elaborate training area is provided. In the training area, steel mockups of typical Air Force type aircraft are constructed. These range from the century series jet fighters to a mockup of a B-47 jet bomber. Fuel is piped directly to spray nozzles under the aircraft to provide a realistic spill area. The fires I observed, and in some cases participated in, involved fuel spills ranging from 500 to 1,000 gallons and covering areas from 125 to 150 ft. in diameter.

Rescue of occupants

While undisputedly, the rescue of the occupants of the aircraft is the primary objective of all crash fire fighting, we must differ in this respect with the Air Force. They are faced with hazards such as the possibility of nuclear weapons on board and also ejection seats which create a real danger to the personnel conducting the rescue operation. However, while they are faced with the task of rescuing one to five able bodied crewmen, we must adjust our thinking to encompass not only the crew but also passenger loads ranging from 25 to over 125 persons who may be aged, infants or physically handicapped. In view of this I think we must agree that rather than try to conduct a rescue operation only, we must concentrate on complete control of the fire in order to give us the needed time for evacuation.

Fire equipment

For those persons who are unfamiliar with Air Force crash equipment, the basic types used at the school and by Air Force are the Air Force types 0-6, 0-10, 0-11A and 0-11B. The 0-6 is a truck carrying 2,000 lbs. of CO_2 and designed to be used in conjunction with any of the other types. The remaining three types are all foam dispensing and vary primarily in their capacity and discharge rate. The 0-10 has a 550 gal. capacity while the 0-11A and 0-11B are 1,000 gal. capacity trucks. The Air Force has recognized the advantage of the high discharge rate turret. This fact is borne out by the progression of their equipment. The 0-10 crash truck which is the earliest of the three has single 200 gpm turret. This gave way to the 0-11A which has two turret nozzles with discharge rates of 200 gpm each. The 0-11B is a direct modification of this with a single 400 gpm turret nozzle and has proven to be a much superior

***THE RESCUE** of passengers is a complex problem when an air liner burns because passengers may include infants, old people and invalids, aboard a typical flight.*

Courtesy National Fire Protection Association

Courtesy Cardox Division

Federal Aviation Agency Photo

Courtesy Captain B. V. Hewes

Courtesy Captain B. V. Hewes

***REPRESENTATIVE** airport fire trucks. Type 0-6 (above, left) discharges CO_2 snow. Walter Fire Fighter is in use at Washington National Airport (above, right). Broome Country truck (below, left) shows typical equipment for feeder line type airport. Type 0-11 (below, right) is current Air Force equipment and photo below it is the interior of a Type 0-11 truck which illustrates the complexity of modern fire-fighting equipment.*

piece of equipment. The theory involved is that if a bucket of agent will extinguish a given amount of fire, the job will be done much better and the chances of survival of the occupants are much greater if you dump the whole bucket rather than apply the same amount of agent a teacupful at a time.

The Air Force has on order at this time a new crash truck, type P-2, manufactured by FWD, Clintonville, Wisconsin, which will make the 0-11B obsolete equipment. I have a very limited amount of data on this equipment at this time, but in this as well as present equipment they concur with ALPA's thinking as to terrain capabilities. All the vehicles are equipped with all wheel drive and single, high flotation tires as per the proposed NFPA standard 414.

The newest piece of Air Force equipment in use is the H43B Helicopter Fire Fighting Unit. This unit will be discussed in more detail later in this report.

Extinguishing agent

The only substance recognized as a primary extinguishing agent is mechanical foam. It is my understanding that chemical foam is not used by the Air Force in crash fire fighting because of the limitations of this type of agent. For those who are not familiar with the two types, the **chemical** or dry foam is mixed with the water supply and expands due to a chemical reaction. This expansion starts immediately and is taking place while it is in the line. This means that the length of hose that may be used is quite limited. A much higher discharge rate would also have to be provided to give the same effective amount of this already partially expanded foam. The **mechanical** type or liquid foam concentrate is induced into the water supply and travels through the lines as a liquid. All the expansion takes place as it picks up air at the nozzle or as it leaves the nozzle.

CO_2 is used as a quick knock down agent for controlling the bulk of the flame. It is effective when used in conjunction with foam. Due to its gaseous

form it dissipates quickly with wind and has little cooling effect. Therefore, there is always a danger of reflashing if it is not followed by a foam blanket.

The Air Force also uses small quantities of CBM (chlorobromomethane). This is quite an effective extinguishing agent but must be used with caution. When exposed to heat it gives off quantities of phosgene gas which is very toxic in nature. Phosgene gas was first used by the Germans as a poison gas in chemical warfare. Therefore this agent is undesirable where its use in proximity to passengers may be involved.

At this time the Air Force uses no dry chemical as extinguishing agent. The Navy has used dry chemical as extinguishing agent for a number of years and in many ways it is superior to CO_2. A number of the instructors at the school expressed some disappointment in the fact that the Air Force had not adopted this material. Up to this time there has been some problem using dry chemical with foam since some of the ingredients in the dry chemical tend to break down a foam blanket.

In a recent conversation with Mr. George Brelie of the Ansul Chemical Co. he told me that all of their airport equipment delivered after the first of the year (1962) will be charged with Ansul CDC-B which is a foam compatible dry chemical. It is my understanding that it is available at the present time on request.

Application of agent

The proper application of the available agent is one of the most important factors in successfully combating the crash fire. A great deal of emphasis was placed on this phase at the school. The crash crew should be responsible for determining the proper method of attacking the fire and placing the equipment. The two most important factors in determining this are wind and the position of the aircraft in the spill area. The attack will be made from the upwind side whenever possible. Consideration will also be given to the distance from the edge of the spill area to the aircraft, i.e., the smallest amount of fire that must be controlled to reach the aircraft and begin rescue operations. In some cases these factors will be influenced somewhat by terrain conditions.

While the most common conception of controlling any fire is to start at the perimeter and sweep the fire ahead of you, this is not true in the use of foam on a crash fire. The foam turrets should be directed first on the fuselage of the aircraft. With the cooling effect of the foam on the fuselage, the chances of survival for persons trapped inside will be much greater. The effect of the foam bouncing off the fuselage will blanket the area immediately surrounding the aircraft and while a great deal of perimeter fire may still be present, the danger to the aircraft and occupants is minimized. In some cases where large spill areas are involved it may be possible to reach the aircraft immediately only by actually driving the crash trucks into the spill area. The Air Force crash trucks are equipped with ground sweep nozzles on the front of the truck and under body nozzles so that the truck may accomplish this by traveling on its own foam blanket.

It boils down to this—don't sweep the fire toward the fuselage but start at the fuselage and work towards the perimeter.

Training of fire and rescue personnel

This subject is very closely tied in with the preceding paragraphs and cannot be over-emphasized. The value of training was very evident in watching the performance of the students at the school as they fought their first fires and comparing it with their performance later in the program. It was even more dramatically shown by seeing the performance of the instructor personnel. For example, the instructor personnel could control as much fire with the 0-11B alone as the students could with the three pieces of equipment mentioned earlier. This fact should surely offer some food for thought.

There is also a psychological problem involved that can only be overcome by training. A few large scale "hot drills" will give the crewmen confidence in the capabilities of themselves and their equipment. Let me further emphasize this with a question. Would you drive a truck into a blaze because someone said it could be done?

Training of aircraft crew members

While I was at the school I learned of an incident involving a MATS transport. Following a crash landing, the transport caught fire. The crash crew attacked the fire from the left side of the aircraft, not realizing that the occupants were evacuating through an emergency exit over the right wing. The firemen swept a part of the fire under the fuselage engulfing the right wing area. There are a number of factors which might have contributed to this situation, however, some knowledge and understanding of the action of the fire fighters by the crew and vice versa may have prevented this situa-

Continued on page 26

***THE CRASH** of a DC-8 last July at Stapleton Field, Denver, aroused nationwide concern in the adequacy of fire fighting equipment at major airports. A recent ALPA survey gives only 8 per cent of the nation's airports a good protection rating, 35 percent have some protection and 57 percent, no protection.*

Wide World Photos

Restrain yourself

Photo courtesy Aviation Crash Injury Research

Whether a shoulder harness is a help or a hindrance is the subject of this story on safety equipment.

By GERALD BRUGGINK, Aviation Crash Injury Research, F.S.F.

AvCIR staff member, Harold F. Roegner, former TWA captain, demonstrates use of shoulder harness as installed on crew seat in simulated pilot's position.

WHEN your are responsible for several million dollars worth of hardware and human lives, you don't want to be bothered with seemingly minor details. This is a healthy attitude in an environment kept intact only by constant alertness and decision making. Yet, there are times when attention or lack of attention to some lowly detail spells the difference between interment with full honors and the not so honorable grilling by an accident investigation board. Poor as this choice may be, we will assume that the average pilot prefers temporary affliction to the permanent type. We will also assume, without any attempt at cynicism, that common sense takes precedence over rank, pay scale, and age in matters concerning self-preservation.

Based on these assumptions we can, without embarrassment, bring out in the open a question that we have been asked repeatedly by representatives of airlines at home and abroad: "How can we induce our pilots to use their shoulder harness?"

Now that the cat is out of the bag, let's examine the nature of the beast. The question itself reflects three basic facts: (1) A certain number of knowledgeable people sincerely believe in the protection offered by the shoulder harness; (2) all the pilots referred to by the airline representatives had a shoulder harness available in their aircraft;[1] (3) some pilots are not aware of the advantages of a properly used shoulder harness.

Although we cherish the truth, we must admit that the facts revealed by the question are simply statements of the obvious and, as such, they fail to stir our feelings. A lifelong association with pilots has us convinced that even this pre-eminent group has clear-cut reasons for doing and not doing certain things. We feel so strongly about this that we suggest basing a solution for this problem on a more fundamental question: "Why don't pilots use their shoulder harness?"

Why don't they?

We did some research on the subject and found that many pilots have valid objections to the use of the shoulder harness such as:

—"Some types of shoulder harness are so uncomfortable to wear, that it is doubtful whether the safety factor is worth the loss of comfort."

—"The restriction of movement imposed by some types of shoulder harness may be hazardous in emergency situations."

—"To fasten or unfasten the shoulder harness you have to release the seat belt and you need about four hands to catch up with the loose ends."

—"It is often difficult to reach the straps when you want to fasten them, while some types are constantly in the way when not in use."

—"The dye of the harness webbing rubs off on your shirt when you perspire."

These are sound arguments which cannot be shrugged away with an annoyed, "Why care? They are not using the shoulder harness anyhow." Actually, there are indications that some pilots have never been exposed to a properly designed and properly installed shoulder harness. Therefore, we can return the hardware part of the problem to the lap of those who created it: the manufacturer and the procurement officer.

On the other hand, we also found that even the ideal type of shoulder harness can be underrated by the uninformed or prejudiced pilot. Noteworthy in this respect are the following comments:

—"The inertia reel did not appear to be functioning. It could be unreeled at any time."

—"How do I know if the inertia reel will lock automatically during deceleration."

—"The only time the reel seemed to lock at all was manually."

—"The shoulder harness restricts my movements when locked."

—"With the shoulder harness tightly adjusted, I can still hit my chin on the wheel."

—"I'm afraid of the buckles over my chest and the straps right on my collar bones."

These critical comments indicate sufficient lack of understanding of the function of the inertia reel as to justify brief discussion of this gadget.

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The Inertia Reel

Every standard shoulder harness worth its name is anchored via an inertia reel to the pilot's seat or to aircraft structure. The basic function of the reel is to give the pilot full freedom of movement during normal operating conditions while automatically locking the shoulder harness during an abrupt deceleration.

The freedom of movement is obtained by making the reel cable, to which the harness is attached, spring-loaded. This allows shoulder harness extension without apparent restraint (this is the way it should be!) while constantly taking up any slack.

We will save you a description of the well hidden secret of the automatic locking mechanism. Let it suffice to state that this device, during the more than twenty years of its use in aircraft, has never been known to fail when needed. It is so foolproof that a preflight check of its function would fall into the same category as triggering a fire extinguisher to make sure it will work when needed.

To avoid confusion it should be mentioned here that there are two types of shoulder harness reel presently in operational use. The impact-sensitive type takes a 2-3 G impact on the inertia reel housing itself or on inertia switch to lock automatically. Normal flight loads, including severe turbulence, will not activate this reel. To check its operation before take-off, you would have to tap it lightly with a hammer and this would undoubtedly arouse suspicion amongst the passengers. It is so much more convenient to take the manufacturer's word for it, as you do in the case of so many other black boxes in the aircraft.

The rate-of-extension type harness reel, although mechanically different, serves the same purpose. Its automatic operation during impact depends on the speed with which the harness is "reeled off," which makes it a function of the rate of upper torso displacement, regardless of direction. A well-designed reel of this type will lock automatically before the occupant travels more than ½-inch during an emergency deceleration. The G-setting is factory adjustable and normally coincides with a 2-3 G abrupt deceleration. Incredulous Thomases will be pleased to know that the automatic operation of this reel can be checked at any time by a jerk on the shoulder straps. This will also demonstrate how the shoulder harness, after being locked automatically, reels the pilot in every time he bounces back toward his seat. Eventually he'll find himself firmly secured against his seat back. To break this embrace and to restore the reel to its automatic function, the control lever should be moved to "manual" and then back to "automatic."

There are indications that the G-setting of the rate-of-extension type reel occasionally is adjusted too low. In this case, sudden movement of the upper torso as a result of emergency manipulations may result in locking of the harness. This interference with emergency duties must be avoided at all cost and pilots are advised to check the proper G setting of their reels by simulated emergency manipulations.

A few words on the manual control lever will clear possible superstitions in that area. Both types of reels have identical control levers, usually mounted on the seat arm or other convenient location. The lever has two positions: "manual" and "automatic." The manual position permits the pilot to lock the reel if he anticipates severe conditions or any time he wants to be held tightly. This prevents further cable extension but does not keep the reel from taking up slack in the harness whenever the pilot leans back. Normally the control lever should be in automatic position. This makes the shoulder harness anonentity, that is, you should hardly be aware of its presence when performing your cockpit duties. At the same time, it will protect you in the described manner should the occasion arise.

Why should they?

Although a discussion of the reasons why some pilots don't use their shoulder harness may seen a rather negative approach to the problem, we have learned at least that their reluctance in this respect has a lot to do with the design and installation of the shoulder harness and the indoctrination in its use. The obvious conclusions are left to those who can remedy this situation.

From here on we'll proceed on the assumption that every pilot has a properly designed and installed shoulder harness at his disposal and knows how to use it. What reasons does he have to use it? And how can you induce him convince him would be to show actual photographs of the face-losing effects of not using a shoulder harness during a survivable crash deceleration. These pictures are available, but we dislike this approach since we are not competing with the popular press. We prefer to convince potential shoulder harness users in a more intelligent manner by stating a few pertinent facts:

1. Crew members are exposed to a more injurious environment than most of their passengers. Indisputable statistics (forgive the expression) prove that head injuries of cockpit occupants not wearing a shoulder harness are the most frequent cause of fatal and serious injury. Only adequate upper torso restraint can prevent or minimize this.[2]
2. Use of a shoulder harness in conjunction with the seat belt considerably increases the human tolerance to transverse deceleration since it keeps the spine perpendicular with respect to the direction of crash force.[3]
3. The idea that emergencies will allow sufficient time to don the shoulder harness is an illusion. A brief review of survivable transport accidents will convince anybody that, with the exception of some anticipated ditchings, foreknowledge of a crash deceleration

Ninth Annual ALPA Safety Forum convenes October 17-19

ALPA's Ninth Annual Air Safety Forum will convene October 17-19, at the Del Prado Hotel, Chicago. General theme of the program will be "Increasing the Efficiency of Air Traffic Control." In addition, panel discussions involving all weather flying and helicopter operation will be held.

Principal speaker will be Najeeb E. Halaby, FAA Administrator. Distinguished guests will include M. N. Gough, Director, CAB Bureau of Safety; M. B. Hartranft, President, Aircraft Owners & Pilots Association; W. K. Lawton, Executive Secretary, National Business Aircraft Association; Captai S. Saint, American Airlines representative; Captain J. D. Smith, United Ai Lines ATC representative, and Jack F Cram, President, National Aircraf Noise Abatement Council.

The forum will bring together ALP safety committee members and industr guests. The complete agenda appeare in the September 25, 1961, issue of th *ALPA News Bulletin*. ALPA member are urged to study the agenda and for ward discussion suggestions to thei Central, Regional and Area Safety Chairman who will attend the Forum

seldom leaves enough time for a rash of clear-headed actions, typical in Hollywood versions.

4. In-flight emergencies (extreme CAT, [clear air turbulence,] violent evasive action, sudden control malfunction, etc.) are much better handled by a man who is firmly restrained in his seat than by a body floating through the cockpit. Incidents have repeatedly shown that unexpected maneuvers may snap your flagship into the type IV (acrobatic) category in less time than it takes to fluster a new stewardess. A one-time exposure to a solid dose of negative or lateral G's, without the benefit of a shoulder harness, will convince anybody that it pays to restrain yourself.

How to use it

Elementary as it may sound, we feel that a few remarks on the proper adjustment of shoulder harness and seat belt may prevent some unnecessary harness harassment. A little guidance goes a long way, as we found out in the case of one of our female offspring when first exposed to the bridling effects of a girdle. Her violent objections melted under the insistence of parental warmth and by the time she began to appreciate the girdle's protective value, experience had taught her to live comfortably and gracefully within its confines.

The seat belt should always be as tight as comfort will permit, regardless of the use of a shoulder harness. The seat belt webbing should cross the hip bones at approximately 45 degrees. This positions the buckle over the lap instead of the abdomen and prevents constant pressure in this tender region while allowing unrestricted upper torso movement. The snubbing action of a loosely worn seat belt is a generally recognized hazard so that further comment is unnecessary.

The shoulder straps should be adjusted tight enough to take up all slack without exerting an upward pull on the seat belt. The pressure on both shoulders should be equal and hardly noticeable. Care should be taken not to restrict your freedom of movement, afforded by the springloaded inertia reel cable, while adjusting the straps. We know of a case where an inexperienced pilot took up all available cable length by excessive shortening of the shoulder straps. He ended up with the "V" of the shoulder harness rubbing his neck and unable to move although the control lever was in "automatic."

The best way to prevent inadvertent strangulation and immobility is to set the control level to "manual" before fastening the strap ends. This forces you to properly elongate the straps instead of pulling the strap ends down against inertia reel tension. After the straps are fastened, they should be drawn just tight enough to take any slack out of the webbing. This results in a "no tension" condition when you are in a normal seated position. It is impossible to forget to move the control lever back to "automatic" unless your arms are twice as long as they are supposed to be.

When to use it?

This question relates to the shoulder harness only since we must assume that every crew member has enough sense of responsibility to wear his seat belt at all times when he is actively engaged in the operation of the aircraft. We would like to say the same thing with regard to the shoulder harness, but years of frustration have dulled our crusading instincts to the extent that we enjoy a reputation of reasonableness in flight-deck circles. To foster this impression, we have tried to relax our views without torturing our own conscience. Here is the result: *It is our opinion that the pilot "on duty" i.e., the man responsible for the control of the aircraft, should be wearing his shoulder harness at all times. Whenever the passenger seat belt light is on, all crew members should have their shoulder harness fastened.*

If you think that these watered-down requirements are exaggerated, you are underrating the importance of your job as executive officer in the most sensitive spot of modern air transportation. You are cruising at speeds and altitudes that were limiting yesterday's jet fighter generation. Talking about comfort, your military colleagues, who fly the big Air Force stuff, fly missions of longer duration with full restraint at all times, in addition to a helmet. This requirement is not based upon their personal safety only. It has a lot to do with the country's capital investment in their equipment and mission. By the same token, we venture to say that the use of shoulder harness should not be left to a pilot's likes or dislikes. There is more at stake than a well-ironed shirt and personal comfort. A well-restrained man behind the controls is low cost insurance against the intangible odds of high-performance flight.

After this poetical outburst, we'll dismiss this controversial subject with some raw advice. Your willingness to wear the shoulder harness should be based upon a properly designed and installed shoulder harness. If the outfit in your aircraft does not fit this description, make it known.

There are good shoulder harness installations on the market for discriminating people. It is just a matter of getting the parties involved "on the ball."

Finally, we admit that your chances of ever having to rely on the use of a harness are remote, from the Las Vegas point of view. However, the crude state of the art of crystall ball gazing makes gambling in our profession very unpopular.

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[1] *Civil Aeronautics Manual* 4b. 3577 (5), Transport Categories, states: "Seats for all crew members at flight deck stations shall incorporate provisions for the use of a shoulder harness."

[2] *NASA Memo* 5-19-59 E: "Human Tolerance to Rapidly Applied Accelerations. A Summary of the Literature" (A. M. Eiband).

[3] *NACA Technical Note 3775:* "Crash Injury" (G. T. Pesman and A. M. Eiband).

Compass deviation traced to passenger's tape recorder

Transistorized tape recorders—as well as small transistor radios—operated by airline passengers in the cabin of a jetliner can cause interference with navigational equipment, according to a report from Capt. Jeff Holton, of BOAC related to Tom Towers, Director of the Los Angeles Sound Abatement Coordinating Committee.

Capt. Holton was en route from London to LAX recently, when he observed all compass equipment in his 707 was responding improperly over the Denver area. A check with an FAA ground station confirmed that the jetliner was slightly off course.

Holton asked his engineer to check the compass mounted on a bulkhead wall in the cabin to determine if a passenger was too close to the instrument with some type of metallic object. The engineer reported "negative."

When the compasses remained inaccurate, Holton sent the engineer back to the cabin a second time for a check of each passenger. It was on this second inspection that the engineer found a passenger recording souvenir comments from fellow passengers on a miniature transistorized tape recorder.

After the tape recorder was switched-off, the magnetic field cleared in about 10 minutes and the flight proceeded, on course, to LAX without incident.

With the Flight Attendants

BNF flight attendants benefit from new ALPA contract

A new contract carrying substantial pay increases and improved working rules for 300 flight attendants of Braniff Airways was announced September 13 by the Air Line Pilots Association (AFL-CIO).

The agreement is effective October 1, 1961, and runs until June 1, 1963. The new contract provides for pay increases over previous scales of as much as $110 per month for senior flight attendants on piston engine aircraft, $126 per month on prop jet aircraft, and $141 per month on pure jets, according to ALPA president C. N. Sayen.

New scales, providing for equipment differentials for the first time and calculated on a formula of base pay plus hourly pay for more than 70 hours flight time, produce the following comparative ranges of compensation for 85 flying hours:

1. On piston engine aircraft, from $371.25 per month for newly hired flight atendants to $486.25 for flight attendants with nine years service, compared to a previous range of $270 to $375 per month.

2. On prop jet aircraft, from $386.25 per month for most junior attendants to $501.25 for senior attendants, compared to a previous range of $270 to $375 per month.

3. On pure jets, from $401.25 per month to $516.25 per month, compared to a previous range of $270 to $375 per month.

Under the agreement, rates are retroactive to expiration of the last agreement on September 1, 1959, and will result in retroactive payments averaging more than $1,050 per atendant.

Twenty-one changes were made in rules and working conditions, including important provisions relating to maximum time on duty and an employee's option to fly only 80 hours on jets if they so desire and designate.

The contract is the first to be negotiated by ALPA for the Braniff attendants since they overwhelmingly rejected their previous representing organization — The Air Line Stewards and Stewardesses Association — and designated ALPA as their collective bargaining agent in federally conducted elections in February of this year.

NAL flight attendants vote for ALPA representation

Flight attendants of National Airlines have voted for the Steward and Stewardess Division of the Air Line Pilots Association, to represent them under provision of the Railway Labor Act.

Results of the election, conducted under the auspices of the National Mediation Board which counted ballots in Alexandria, Va., July 26, showed that of the 252 eligible voters, 167 voted; 89 for ALPA, 75 for the Transport Workers and three ballots were voided.

Flight attendants of Allegheny Airlines have voted unanimously for the Steward and Stewardess Division of the Air Line Pilots Association, to represent them under provisions of the Railway Labor Act.

Results of the election, conducted under the auspices of the National Mediation Board which counted ballots in Alexandria, Va., July 31, showed that of the 91 eligible voters, 73 voted; 72 for ALPA with one ballot voided.

This marks the thirteenth and fourteenth victory for ALPA and shows that flight attendants, when allowed to designate the collective bargaining agent of their choice through elective processes, continue to show preference for a single union to represent flight crew members.

In all elections, the S and S Division of ALPA has received over 85 per cent of the 2,439 valid votes cast, compiling a total of 2,074 to 377 for other groups, thereby giving the pilots' organization recognized and confirmed representation rights to more than 2,900 flight attendants.

The other elections were held on United, Braniff, Pacific Northern, West Coast, Alaska, Mohawk, Capital, Piedmont, North Central, Continental, Ozark, Frontier and National. Additional elections are pending, when federal mediators are available, on Aloha, Lake Central and Hawaiian.

United Air Lines photo

***FOUR Flying Andersons:** Stewardess silver wings of Lee Anderson (second from right) are examined by sister Evelyn as their parents, Mr. and Mrs. Archie Anderson, look on. With the graduation of Lee at Denver as a United Air Lines stewardess, the entire Anderson family has air line ties. Mrs. Anderson flew as a United stewardess in 1933-34. Evelyn has been a United stewardess since 1958. Mr. Anderson is a flight manager for United, based in San Francisco.*

NOR receives Award of Honor for safety record

North Central Airlines received the National Safety Council's coveted Award of Honor for its outstanding 1960 safety record. The award presented July 18, to North Central was also presented to eight other air lines.

The airline has won a safety citation for every year since it began scheduled operations in February, 1948. During this period, North Central has flown over 930 million passenger miles and carried more than 5,800,000 passengers without a single injury to passengers or crew members.

Hal N. Carr, president of the Minneapolis/St. Paul-based airline, praised all North Central employees for maintaining the 13-year record by their careful attention to company safety regulations and programs.

North Central, which led the nation's 13 local airlines last year in passengers, mail, and cargo carried, received the aviation safety award given to domestic, territorial and overseas airlines flying passengers routes.

The citation is made to those airlines which do not have a fatal accident during the calendar year and which have a major accident record lower than the average for the group during the preceding three years. The Council defines a major accident as one which involves serious injury to occupants or substantial aircraft damage.

The Safety Council bases its award on cumulative hours. The Award of Honor, highest of three categories, is based on 75,000 aircraft hours (hours in the air). Only nine airlines received the Award of Honor.

Electronic hand-off system to be studied

A $17,000 study contract for the design of an electronic method of transferring control of aircraft from an air route traffic control center to an airport control tower has been awarded to the Orlando Division of The Martin Company by the Federal Aviation Agency.

The design investigation is to define the most feasible methods and equipment required for interconnecting remotely separated radar scan converter TV marker hand-off equipments and adaptation of this equipment for presentation of data on various types of existing PPI radar displays.

Currently a controller handling an aircraft enroute from one city to another identifies the radar target to the tower controller by verbally describing its position. An electronic hand-off system would assist in the identification of the radar target and would augment the verbal method.

Because more and faster aircraft are increasing the crowded conditions on the nation's airlanes, aviation officials see a need for electronically identifying radar targets when control of an aircraft is being transferred.

FAA plans acoustical study of airport noise

Acoustical studies of aircraft noise at selected airports throughout the country will be made by a Washington, D. C., firm under a contract with the Federal Aviation Agency.

The airports to be surveyed by Polysonics, aviation acoustical consultants, will include Washington National, New York International (Idlewild), and Baltimore Friendship International. Other airports have not yet been selected.

Data obtained will assist airport authorities, zoning commissions, and others interested in aircraft noise in the planning of new airports, runway locations, land use, and in noise abatement procedures.

Specialized noise-measuring techniques will be employed by the firm to obtain accurate noise level data concerning 16 of the latest jets, turboprops, piston-engine aircraft, and turbine-powered helicopters. Noise readings will be taken in areas adjacent to the airport which underlie the take-off and landing paths of primary runways.

Under the terms of the contract, the firm will obtain noise measurements on the ground and furnish the FAA drawings of takeoff and landing profiles for each aircraft studied. The drawings will assist in defining noise sensitive areas adjacent to the airport.

Aircraft noise will be measured under daily field operational conditions. Three simultaneous measuring stations will be used, comprising one central station and two side stations. The central station will be located on the extended runway centerline. The two side stations, using identical equipment, will be located on each side of the central station, off the runway at varying distances. The side stations will move around to different locations to get a wide number of measuring points for a high degree of noise accuracy.

Air-ground communications will be monitored by the central station to facilitate setting of controls and alerting the side stations, by intercom, to oncoming aircraft. Each side station will sight the aircraft through a transit while it is immediately opposite the station. At the proper moment, the side station will trigger an automatic marker on chart paper to record instantaneous noise level in relation to the precise position of the aircraft.

The 16 aircraft to be surveyed include various models of the Boeing 707, Douglas DC-8, Convair 990, Caravelle, Lockheed Electra, Lockheed Constellation, Viscount, Aero Commander, and three types of helicopters.

Runway Foaming . . .

Continued from page 9

agreed to by the pilot and should be so calculated to run continuously the full length of the projected slide. For a defective or "cocked" nose wheel with main gear fully operational, it is recommended that the runway foam pattern should be at least one-half the width of the main gear tread, laid down the center of the runway, beginning at a point agreed to by the pilot (usually further down from the threshold than for a main gear or wheels-up landing) and calculated to run continuously the full length of the projecting landing.

i. Aging of the foam prior to use for a period of 10 to 15 minutes is desirable to permit water to drain from the aqueous foam and create effective runway surface wetting within the foam pattern. Aging for too long a period (say over 2½ hours) prior to use on a hot summer day may be disadvantageous due to excessive drying and water runoff.

j. To be effective a continuous layer of foam in the proposed slide path is essential as any interruptions, holes or breaks might result in the formation of incendiary sparks of sufficient duration and intensity to cause ignition of any flammable vapors which were present.

k. Depth of the foam should prefer-

Continued on following page

Runway Foaming:

Continued from preceding page

ably be two inches to achieve even distribution and so that the foam has good "holding" characteristics (capable of holding the water at the runway interface without excessive drain-off due to runway slope or because of its "crown"). Foam of less depth may be satisfactory if continuous, if it drains properly, and if it has the ability to retain the water content at the runway surface. Foam expansions of 8 to 12 appear to be satisfactory for this purpose.

1. That following foam laying operations, airport fire crews leave the aircraft operational runway and take up stand-by positions out of range of all collision hazards. After the aircraft touches down, rescue and fire fighting vehicles should follow the aircraft and be ready to operate. (End of quoted material.)

The Crash Fire Committee of this Association will make a continuing study of all further reports on the subject of runway foaming and we request the cooperation of all members in forwarding any information that they think would be of use to our Committee. In the meantime, we repeat our recommendation. Subject to the limitations and procedures laid out in **NFPA Bulletin 420-M,** the practice of runway foaming for pre-planned emergency landings is endorsed by your Crash Fire Committee.

Vic Hewes and Bill Collier

HOW THE AIR FORCE . . .

Continued from page 20

tion. Some method of **communication** may also have been beneficial. A little knowledge and thought by the crew as to what may be going on outside the aircraft may increase their chances for survival.

H43B fire fighting helicopter

The use of helicopters as crash fire equipment is a relatively recent development. The Air Force has been gradually gaining momentum in this field since 1958. While I did not actually observe this unit in action I did have an opportunity to talk to some of the instructors who had served as crew members and had actual field experience with this unit. The complete unit consists of an H43B helicopter, a fire fighting kit which is transported to the scene of the crash by the helicopter and a trailer assembly for storing the kit. The trailer assembly had a Janitrol heater unit to keep the kit from freezing in cold weather. The kit itself is foam dispensing with a capacity of 78.5 gals. of water and five gals. of liquid foam concentrate for the production of mechanical foam. It has 150 ft. of hose with a discharge rate of 100 gpm. It will give continuous application for a period of 52 seconds. It carries a container of high pressure nitrogen (3,000 psi) metered to 210 psi which enables it to throw foam a distance of 55 feet.

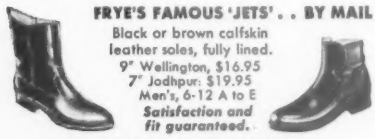
While this sounds like a very limited piece of equipment, in capabilities it compares favorably with the crash truck, type 0-10, which carries over seven times as much agent at three times the discharge rate. The equalizing factor is the helicopter itself which lends its rotor wash to the effort. The original evaluation test report indicates that this unit was used successfully on fuel spills ranging from 250 gals. to 1,500 gals. In all cases the 250 gal. spills could be controlled by the helicopter alone. The helicopter has also been used effectively with conventional crash trucks and from this standpoint I believe that this warrants further study as a possible effective rescue aid. The Air Force is conducting training for helicopter fire fighting teams at Stead AFB, Nevada. Possibly some film strips could be obtained and a further discussion of this would be in order at the next Safety Forum.

Conclusion

With the equipment available at a few of our larger airports together with **well trained** crews, I believe we can expect a reasonable chance for survival in **most** crash fires. The Air Force has had some experience with crash fires in the larger jet bombers involving fuel spills of over 15,000 gals. and spill areas of 250,000 sq. ft. It seems to be the concensus of opinion that a full scale conflagration of this magnitude cannot be successfully combated with the type and amount of equipment available at most of their bases. Since we may be faced with fires of this same scope or larger on some of the jet transports it seems reasonable to assume that we should be even more concerned with the capabilities of our airport-fire departments.

The absolute necessity of adequate training cannot be too strongly impressed on the people responsible for our fire protection. While few of us will actually help combat a crash fire, a certain amount of knowledge as to the methods employed may materially increase the chances for survival of our passengers and ourselves. Let us not be complacent about the situation but lend our efforts toward attaining our goal of having adequate fire protection on every airport in the nation.

None of the preceding material should be construed as representing official Air Force policies or procedures.



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ESTATE PLANNING & GENERAL INSURANCE
CHICAGO MIDWAY AIRPORT
POrtsmouth 7-6838 4848 W. 63rd St., Chicago 38, Ill.

THE PROBLEM . . . .

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is now on leave from the acoustical consultant firm of Bolt, Beranek and Newman, reviewed the total noise situation as related to community reaction and stated that "Science offers no panacea for protecting communities against aviation noise." "Nor," he said, "should anyone expect to find a solution to the noise problem that will be 100 per cent agreeable to all interests. Everyone must give and take." He also warned that major advances (in aviation) will require *nationwide planning* for aviation facilities, airports, air lines, surrounding rural and urban areas and flight operations. This planning, Doctor Bolt concluded, is one for the coordinated action by all parties involved, rather than a project for scientific research.

The National Aircraft Noise Abatement Council (NANAC) is an independent, non-profit corporation founded and supported by the Air Transportation Association of America, The Aerospace Industries Association and the Air Line Pilots Association. It is directed by a president who reports to a Board of Directors. NANAC's president is Brigadier General Jack R. Cram (USMC, Ret.), a veteran of over thirty years of civil and military aviation experience.

The council is a purely national organization. It will not administer local programs nor will it participate in the conduct of local programs except in an advisory capacity.

The council has as its major objective and purpose the development and coordination of an effective national aircraft noise abatement program.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933; JULY 2, 1946, AND JUNE 11, 1960 (74 Stat. 208), SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF

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1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Air Line Pilots Association, International, 55th St. and Cicero Ave.; Editor, Ed Modes, 55th St. and Cicero Ave.; Managing editor, None; Business manager, None.

2. The owner is: Air Line Pilots Association, 55th St. and Cicero Ave.; Clarence N. Sayen, President; J. C. Carroll, First Vice-President; P. G. Atkins, Secretary; D. J. Smith, Treasurer, all of 55th St. and Cicero Ave.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. Average monthly circulation for the year 1961: 20,860.

(Signed) ED MODES, Editor.
Sworn to and subscribed before me this 1st day of October, 1961.

(Seal) GLYN R. JOHNS
(My commission expires Feb. 17, 1964.)

Traffic rights for . . .

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country its rightful place in world aviation. We ask no more. We are willing to grant each other country no less. We cannot afford, however, to be restricted and hampered on the one hand in our international operations, and to be taken over the coals by some foreign carriers operating in U. S. territory, which carriers are taking advantage of the reasonable terms of their agreements with us. We must have adherence to agreed principles without equivocation. Short of that, the principles must be reworked and reworded to permit of no equivocation.

If you have no responsibility in this area, you have at least a great interest in it, because at stake is the future of our international air transportation system, at once so vital to our commerce, our postal service, and our defense, which is why I picked this topic.

I do not mean to take a protectionist view, but we are working within a treaty area. Certain terms have been imposed on us as the price of agreement. We deal with sovereign countries and must make concessions to their points of view. If our carriers must be shackled in this or that respect, then foreign carriers must operate within the same restrictions, otherwise we simply will be slaughtered economically. A detailed study of the situation may indicate that the limitations on our carriers' services should be lifted altogether, whereupon I would happily agree to remove restrictions on foreign carriers. Whichever way it is to be, the airline companies of all countries must operate within the terms of the agreements, and their governments must see to it that there is no evasion. We stand ready to do just that: to honor our foreign commitments. We must insist that at the same time that commitments to us are met with similarly.

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Captain Oscar William Cleal

Oscar Cleal has worked hard for his fellow pilots to improve their security programs. His article in the July "Air Line Pilot" is the most comprehensive I have seen. As insurance chairman of his airline, he wanted our insurance for his fellow pilots, but arrangements had not been completed when on July 31st he was shot by a hijacker. The details are below.

On July 31st Capt. Oscar Cleal was a 14 year Pacific Airlines captain at the controls of his DC3 awaiting completion of the loading of his passengers. Seconds later a wild eyed passenger waiving a gun was demanding to be flown to Arkansas, far off Pacific's routes. Oscar and his co-pilot tried to reason with the gunman when suddenly he turned and fired point blank. Oscar is now out of danger but what remained of his left eye had to be removed by surgery. The vision in his right eye we confidently hope will return to normal. His airline flying is finished and the education of his small children is still in the future. We have established a "Captain Cleal Fund" for this purpose. If you would care to contribute, just send your check, made payable to Oscar W. Cleal, to me at the address below. I can't escape the feeling that it could have so easily been any one of us instead of Oscar.

Harvey W. Watt

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